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Noise and Vibration

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14. Noise and Vibration

14.1 Introduction

- 14.1.1 This Environmental Statement (ES) chapter details the likely significant effects of the project on noise sensitive receptors (NSR). The receptors considered within this chapter comprise human receptors, particularly residential and community receptors, close to and within the Order Limits. Potential vibration effects on structures and buildings close to and within the Order Limits are also considered. Effects of noise and vibration on ecological receptors are considered in ES Chapter 7: Biodiversity (**application document 6.2.7**).
- 14.1.2 Noise is generated during construction through the use of machinery, particularly certain equipment such as that used for trenchless crossings (drilling) and piling foundations. Noise may also be generated due to increased traffic on the road network.
- 14.1.3 Operational noise can be experienced from overhead lines (crackle associated with corona discharge) or due to equipment such as at the grid supply point (GSP) substation. However, the embedded measures in the Register of Environmental Actions and Commitments (REAC) (**application document 7.5.2**) would reduce the level of operational noise such that it is not significant. Operational noise from overhead lines and the GSP substation is therefore scoped out of the ES. The underground cables and cable sealing end (CSE) compounds would not generate noise during operation and are similarly scoped out of further assessment. Further details regarding the Planning Inspectorate's acceptance of both aspects being scoped out can be found in Sections 14.3 and 14.4.
- 14.1.4 This chapter has links to other documents, in particular ES Chapter 7: Biodiversity (**application document 6.2.7**), which considers noise and vibration effects on ecological receptors; ES Chapter 8: Historic Environment (**application document 6.2.8**), which considers noise and vibration effects in relation to historical assets, including listed buildings; and the Transport Assessment (**application document 5.7**), which provides the baseline information used to inform the noise assessment relating to construction traffic.
- 14.1.5 Cumulative effects between the project and other proposed developments as well as receptors affected by more than one source of direct environmental impact resulting from the same development are considered in ES Chapter 15: Cumulative Effects Assessment (**application document 6.2.15**).
- 14.1.6 This chapter is supported by the following appendices:
- Appendix 14.1: Construction Noise and Vibration Data (**application document 6.3.14.1**);
 - Appendix 14.2: Construction Traffic Noise and Vibration Assessment (**application document 6.3.14.2**);
 - Appendix 14.3: Overhead Line Noise Assessment (**application document 6.3.14.3**); and
 - Appendix 14.4: GSP Substation Noise Assessment (**application document 6.3.14.4**).

14.1.7 This chapter is also supported by the following figures, which can be found in ES Volume 6.4: Figures (**application document 6.4**):

- Figure 14.1: Noise Baseline;
- Figure 14.2: Potential Construction Noise Effects; and
- Figure 14.3: Potential Construction Vibration Effects.

14.2 Regulatory and Planning Policy Context

National Policy Statement

14.2.1 ES Chapter 2: Regulatory and Planning Policy Context (**application document 6.2.2**) sets out the overarching policy relevant to the project including the Overarching National Policy Statement (NPS) for Energy (EN-1) (Department of Energy and Climate Change (DECC), 2011a). This is supported by the NPS for Electricity Networks (EN-5) (DECC, 2011b).

14.2.2 EN-1 states that energy projects could result in adverse effects from noise and vibration. Paragraph 5.11.4 of NPS EN-1 states, '*Where noise impacts are likely to arise from the proposed development, the applicant should include the following in the noise assessment:*

- *A description of the noise generating aspects of the development proposal leading to noise impacts, including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise;*
- *Identification of noise sensitive premises and noise sensitive areas that may be affected;*
- *The characteristics of the existing noise environment;*
- *A prediction of how the noise environment will change with the proposed development:*
 - *In the shorter term such as during the construction period;*
 - *In the longer term during the operating life of the infrastructure; and*
 - *At particular times of the day, evening and night as appropriate.*
- *An assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive areas; and*
- *Measures to be employed in mitigating noise.'*

14.2.3 Section 2.9: Noise and Vibration of NPS EN-5 states that all high voltage transmission lines have the potential to generate noise under certain conditions and provides details of the conditions under which noise may be generated. Principally, overhead line '*noise is generated when the conductor surface electrical stress exceeds the inception level for corona discharge activity which is released as acoustic energy and radiates into the air as sound. Transmission line conductors are designed to operate below this threshold. However, surface contamination on a conductor or accidental damage during transport or installation can cause local enhancement of electric stress and initiate discharge activity leading to the generation of noise.*' (paragraph 2.9.3)

- 14.2.4 Paragraph 2.9.7 of NPS EN-5 also states that ‘Audible noise effects can also arise from substation equipment such as transformers, quadrature boosters and mechanically switched capacitors. Transformers are installed at many substations and generate low frequency hum. Whether the noise can be heard outside a substation depends on a number of factors, including transformer type and the level of noise attenuation present (either engineered intentionally or provided by other structures). Noise may also arise from discharges on overhead line fittings such as spacers, insulators and clamps.’
- 14.2.5 Paragraph 2.9.10 of NPS EN-5 states that ‘the IPC [Infrastructure Planning Commission, not the Planning Inspectorate] should ensure that relevant assessment methodologies have been used in the evidence presented to them, and that the appropriate mitigation options have been considered and adopted. Where the applicant can demonstrate that appropriate mitigation measures will be put in place, the residual noise impacts are unlikely to be significant.’
- 14.2.6 With regards to mitigation, paragraph 2.9.12 of EN-5 states that ‘Applicants should have considered the following measures:
- the positioning of lines to help mitigate noise;
 - ensuring that the appropriately sized conductor arrangement is used to minimise potential noise
 - quality assurance through manufacturing and transportation to avoid damage to overhead line conductors which can increase potential noise effects; and
 - ensuring that conductors are kept clean and free of surface contaminants during stringing/installation.’
- 14.2.7 With regards to maintenance paragraph 2.9.13 of NPS EN-5 states, ‘The ES should include information on planned maintenance arrangements. Where this is not the case, the IPC should consider including these by way of requirements attached to any grant of development consent’.
- 14.2.8 The consultation draft EN-1 (Department for Business, Energy and Industrial Strategy (BEIS), 2021a) contains the similar text to the current EN-1. The consultation draft EN-5 (BEIS, 2021b) references ‘the selection of the quietest cost-effective plant available’ under the mitigation measures that should be considered in paragraph 2.12.10.
- 14.2.9 Full consideration of the NPS can be found in the Planning Statement (**application document 7.1**).

Other Relevant Policy

- 14.2.10 ES Appendix 2.1: Legislation, Policy and Guidance (**application document 6.3.2.1**) includes legislation and national policy relevant to noise and vibration. It also outlines key guidance documents that have been referenced when writing this chapter.
- 14.2.11 ES Appendix 2.2: Local Planning Policy (**application document 6.3.2.2**) lists the local policy potentially relevant to noise and vibration. The emerging Babergh and Mid Suffolk Joint Local Plan (2020) Policy LP17 and Braintree District Council Local Plan (2022) Policy LPP 70 both require developments to be environmentally sustainable and appropriately mitigated against adverse environmental impacts, such as noise.

14.3 Scope of the Assessment

- 14.3.1 ES Appendix 5.1: Scope of the Assessment (**application document 6.3.5.1**) outlines the scope of the assessment for noise and vibration. This has been informed by the Scoping Opinion provided by the Planning Inspectorate (**application document 6.6**) on behalf of the Secretary of State, following the submission of the Scoping Report (**application document 6.5.1**).
- 14.3.2 The scope has also been informed through engagement with relevant consultees as summarised in ES Appendix 5.2: Response to Consultation Feedback (**application document 6.3.5.2**).

Construction Noise and Vibration

- 14.3.3 The Planning Inspectorate noted in the Scoping Opinion (**application document 6.6**) in ID 4.9.8 that the significant effects would likely be focused at construction hotspots close to NSR, for example cutting of old pylons and breaking out piled foundations. Construction noise and vibration was therefore scoped into the assessment and is summarised within this chapter.

Construction Traffic Noise

- 14.3.4 As traffic data was not available at the Scoping Stage, construction noise in relation to traffic was also scoped into the assessment and is summarised within this chapter, supported by further details in ES Appendix 14.2: Construction Traffic Noise and Vibration Assessment (**application document 6.3.14.2**).

Construction Traffic Vibration

- 14.3.5 Construction vibration from traffic was scoped out of the assessment at the scoping stage as the vibration levels are expected to be less than 0.3 mm/s peak particle velocity (PPV), assuming a baseline of negligible where vibration might be perceptible in residential environments beyond 1m from the road and therefore not perceptible at building receptors beyond this distance within the study area. This conclusion was based on initial calculations using Traffic Induced Vibration in Buildings (Transport and Road Research Laboratory, 1990). The Planning Inspectorate agreed that further assessment of this matter could be scoped out of the ES but requested that the calculations referenced at paragraph 14.6.10 of the Scoping Report (**application document 6.5.1**) should be appended to the ES. This data is provided in ES Appendix 14.2: Construction Traffic Noise and Vibration Assessment (**application document 6.3.14.2**), which confirms that construction vibration from traffic can remain scoped out the assessment.

Operational Noise

- 14.3.6 Operational noise from the overhead lines was scoped out the assessment at the scoping stage on the basis that the project would use triple Araucaria conductors (or alternative technology that performs to the same or better standard) in relation to noise (Embedded measure EM-P03), which is regarded as practically quiet. The Scoping Report (**application document 6.5.1**) concluded that operational noise from the overhead line was therefore not likely to be significant at nearby NSR under any weather conditions. The Planning Inspectorate confirmed in the Scoping Opinion (**application document 6.6**) in ID 4.9.2 that they agreed with this decision. ES Appendix 14.3: Overhead Line Noise

Assessment (**application document 6.3.14.3**) provides evidence supporting this decision. Triple Araucaria conductors (or alternative technology that performs to the same or better standard) aligns with the consultation draft EN-5 (BEIS, 2021b) which states '*the selection of the quietest cost-effective plant available*' should be considered.

14.3.7 Operational noise from the GSP substation was scoped out of the assessment at the scoping stage on the basis that the GSP substation would include a noise enclosure around the transformers and this is built into the designs (EM-H01). The Planning Inspectorate confirmed in the Scoping Opinion (**application document 6.6**) in ID 4.9.2 that they agreed with this decision. ES Appendix 14.4: GSP Substation Noise Assessment (**application document 6.3.14.4**) provides evidence supporting this decision.

14.3.8 The underground cables and the CSE compounds would not generate noise. Therefore, all operational noise has been scoped out of the assessment.

Operational Vibration

14.3.9 The Scoping Report (**application document 6.5.1**) concluded that operational vibration could be scoped out of the assessment on the basis that the only machinery generating vibration would be at the GSP substation and that this was located more than 100m away from the nearest human receptor. The Planning Inspectorate agreed with this in relation to humans but requested further evidence was provided in relation to ecological receptors adjacent to the GSP substation. These effects are assessed in ES Chapter 7: Biodiversity (**application document 6.2.7**) and are not included in this chapter to avoid duplication.

14.3.10 Regular and routine maintenance activities are not expected to cause significant adverse effects at nearby NSR and are scoped out of further assessment. Substantial maintenance activities, such as overhead line reconductoring, may periodically and infrequently be required during the life of the project. However, such activities are likely to generate noise and/or vibration levels similar to or less than those generated during construction. Such works would also be required to apply best practicable means (BPM) to reduce noise and vibration levels. On this basis, no further assessment of noise and vibration impacts from substantial maintenance activities has been carried out.

14.3.11 The specific aspects that are scoped into the noise and vibration assessment are:

- Construction noise from machinery used during the building of the project components (including cutting old pylons, breaking out piled foundations, new piling and drilling operations) on human (residential and non-residential) receptors;
- Construction vibration from machinery used during the building of the project components (including cutting old pylons, breaking out piled foundations, new piling and drilling operations) on human (residential and non-residential) receptors; and
- Construction traffic noise from construction vehicles on the local road network on human (residential and non-residential) receptors.

Project Engagement

14.3.12 National Grid has held meetings with relevant organisations, including Babergh and Mid Suffolk District Council and Braintree District Council which has included discussions regarding the potential effects of noise and vibration on NSR due to the project, and the assessment methodology.

- 14.3.13 Further details on how consultation responses have informed the assessment can be found in ES Appendix 5.2: Response to Consultation Feedback (**application document 6.3.5.2**).

14.4 Approach and Methods

- 14.4.1 This section describes the methodology used to establish the baseline environment and the adopted approach to assessing the significance of potential effects on human NSR. A desk study has been undertaken to inform the assessment of significant effects.

Data Sources

- 14.4.2 The assessment has been informed by a desk study which has drawn on the following key information sources:
- Strategic noise mapping (Department for Environment, Food and Rural Affairs (Defra), 2017);
 - Ordnance Survey (OS) AddressBase Plus data (OS, 2022);
 - Construction schedule and plant information based on similar National Grid projects (e.g. Hinckley Point C and Richborough Connection Projects); and
 - Construction traffic data outputs from the Transport Assessment (**application document 5.7**).
- 14.4.3 All of the information received has been incorporated into the baseline environment description presented in Section 14.5.

Study Area

- 14.4.4 This section describes the study areas used for the noise and vibration assessments. Residential and non-residential NSR have been identified within 1km of the Order Limits and are shown on ES Figure 14.1: Noise Baseline (**application document 6.4**).

Construction Noise

- 14.4.5 The study area for construction noise impacts considers NSR within 300m of the Order Limits. This is based on guidance in British Standard (BS) 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise' (BS 5228-1) (British Standards Institution (BSI), 2014a), which states that caution is needed when making construction noise predictions beyond 300m due to meteorological effects, particularly when a soft ground correction factor has been applied. A 300m study area is also advocated by Design Manual for Roads and Bridges LA 111 (Highways England *et al.*, 2020d).

Construction Vibration

- 14.4.6 The study area for construction vibration impacts, based on guidance from BS 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration' (BS 5228-2) (BSI, 2014b) and LA 111 (Highways England *et al.*, 2020d), is 100m from the closest construction activity with the potential to generate vibration impacts at NSR.

Construction Traffic Noise

- 14.4.7 Noise from construction traffic on the existing road network has been assessed based on the proposed construction traffic routes shown on ES Figure 12.1: Traffic and Transport Study Area (**application document 6.4**). The assessment principally considers the change in basic noise level (BNL) at 10m from the road, calculated in line with the methodology described in Calculation of Road Traffic Noise (CRTN) (Department of Transport and Welsh Office, 1988), with a subsequent assessment of the impacts on NSR within 50m of routes where potential significant effects are identified.

Site Survey

- 14.4.8 Baseline noise surveys were undertaken at the GSP substation to inform the scoping out of operational noise, see ES Appendix 14.4: GSP Substation Noise Assessment (**application document 6.3.14.4**) for details.
- 14.4.9 No further site surveys were considered necessary, as the construction noise impacts have been assessed based on the guidance of BS 5228-1 and LA 111. This sets the construction noise significant observed adverse effect level (SOAEL) relative to the ambient noise level. Baseline noise surveys could therefore only serve to raise the SOAEL above these lower thresholds. The use of the lower SOAEL thresholds therefore represents worst-case assessment criteria for construction noise.
- 14.4.10 The use of raised SOAEL values above the lower thresholds is usually only required in urban areas and areas close to the main transport routes where the increased ambient noise levels would mask construction noise (i.e. higher construction noise levels are required for impacts to be significant in such environments).
- 14.4.11 Given the rural nature of the study area, ambient noise levels are relatively low, as corroborated Defra strategic noise mapping, as well as noise surveys previously conducted in the area. Therefore, baseline noise surveys are not required to inform the assessment of construction noise impacts, and the use of the lower SOAEL thresholds is appropriate.

Assessment Methodology

- 14.4.12 This section sets out the methodology used for assessing the noise and vibration effects scoped into the assessment, as set out within Chapter 14 of the Scoping Report (**application document 6.5.1**).

Value/Sensitivity

- 14.4.13 The value (sensitivity) of residential receptors is embedded in the various noise and vibration assessment criteria outlined below. ES Appendix 5.4: Assessment Criteria (**application document 6.3.5.4**) contains the sensitivity of non-residential NSR (such as educational, healthcare, religious and community type facilities) that form the basis of the assessment relevant to this chapter.

Impact Magnitude

- 14.4.14 The criteria for assigning impact magnitudes, defined in ES Appendix 5.4: Assessment Criteria (**application document 6.3.5.4**), are drawn from the guidance documents described in the following paragraphs for each aspect of the assessment. A summary of applicable threshold magnitude values is also provided.

Construction Noise

- 14.4.15 Construction noise impact magnitudes have been assessed in accordance with BS 5228-1 and within LA 111 (Highways England, *et al.* 2020d).
- 14.4.16 Construction noise levels were calculated at NSR within the 300m study area in accordance with the methodology described in Annex F of BS 5228-1. The predicted construction noise levels at NSR have been compared against the lower noise thresholds (Category A) as detailed in Section E.3.2 of BS 5228-1, which are considered to represent the SOAEL; namely:
- 65 dB $L_{Aeq,T}$ during daytime periods (0700–1900 and Saturdays 0700–1300);
 - 55 $L_{Aeq,T}$ during evenings and weekends (1900–2300 weekdays, 1300–2300 Saturdays and 0700–2300 Sundays); and
 - 45 $L_{Aeq,T}$ during night-time periods (2300–0700).
- 14.4.17 The Category A construction noise thresholds are suitable for quiet rural locations.
- 14.4.18 Exceedance of the SOAEL by between 0 and 5dB is equal to a medium magnitude impact, while exceedance of the SOAEL by greater than 5dB is a large magnitude impact. See ES Appendix 5.4: Assessment Criteria (**application document 6.3.5.4**).

Construction Vibration

- 14.4.19 Construction vibration levels were calculated and assessed in accordance with the methodologies described in BS 5228-2. Vibration levels from construction activities at NSR have been predicted in accordance with the methodology described in Annex E of BS 5228-2.
- 14.4.20 The predicted vibration levels at nearby NSR have been compared against threshold values, as provided by BS 5228-2 to determine potential significant adverse effects including annoyance on people within buildings and potential building damage.
- 14.4.21 The SOAEL for construction vibration effects on people within buildings is 1.0 mm/s PPV where it is likely that vibration may cause complaint in a residential environment but can be tolerated if prior warning and explanation has been given to residents.
- 14.4.22 Cosmetic building damage is not likely to occur at vibration levels below 12.5 mm/s PPV but may occur above this level. It should be noted that levels of vibration two to four times higher would be required to cause potential structural damage.
- 14.4.23 Exceedance of the SOAEL (1.0 mm/s PPV) is considered medium magnitude impact, while a vibration level of 10 mm/s PPV is considered a large magnitude impact (see ES Appendix 5.4: Assessment Criteria (**application document 6.3.5.4**)).

Construction Traffic Noise

- 14.4.24 Noise from construction traffic on the public highway has been calculated in accordance with CRTN (Department of Transport and Welsh Office, 1988) and assessed against the criteria detailed in LA 111 (Highways England *et al.*, 2020d). The BNL from applicable roads has been calculated in accordance with CRTN for the do-nothing and do-something scenarios in the construction period. The calculated BNL values were compared to determine the magnitude of the impact.

- 14.4.25 Exceedance of the change in traffic noise by greater than or equal to 3.0 dB and less than 5.0 dB is considered medium magnitude impact, while a change in traffic noise level of Greater than or equal to 5.0 dB is considered a large magnitude impact. See ES Appendix 5.4: Assessment Criteria (**application document 6.3.5.4**).

Significance

- 14.4.26 Likely significant effects have been assessed using professional judgement considering the sensitivity (or value) of the NSR within the study area, and the predicted magnitude of change (impact) likely to be caused by project activities. These factors are combined to give an overall significance of effect. Likely significant effects, in the context of the Infrastructure Planning (Environmental Impact Assessment (EIA)) Regulations 2017 are those of moderate or greater significance, unless noted otherwise below.

Significance for Non-Residential NSR

- 14.4.27 Significance for non-residential NSR has been derived using the matrix set out in Illustration 5.1 in ES Chapter 5: EIA Approach and Method (**application document 6.2.5**). This has been supplemented by professional judgement, which, where applicable, has been explained to give the rationale behind the values assigned. For example, consideration has been given to the potential duration of the works in determining significance.

Significance for Residential NSR

- 14.4.28 Significance of effects at residential NSR is directly proportionate to magnitude of impact. This has been supplemented by professional judgement.
- 14.4.29 The significance of construction noise and vibration is determined based on magnitude of impact and the duration of exceedance. Significant effects are deemed to occur where there is at least a medium magnitude impact for a period of at least ten days in any 15 consecutive days or 40 days in any consecutive six-month period.
- 14.4.30 The significance of construction traffic noise effects has also been determined based on the magnitude of the change in noise level and the duration of exceedance. A magnitude of change of at least 3 dB (medium magnitude) (or 1 dB (small magnitude) in a noise important area (NIA)) for a period of ten days in any 15 consecutive days, or 40 days in any consecutive six-month period is considered to be significant.

Significance for Construction Vibration on Buildings and Structures

- 14.4.31 Significant effects are deemed to occur if the construction vibration level is predicated to be at least 12.5 mm/s PPV at a structure or building, indicative of potential cosmetic building damage. There is no minimum temporal requirement for this potential impact.

Limitations of Assessment

- 14.4.32 As with all types of assessment of noise and vibration impacts, the assessment depends on the accuracy of data provided by third parties. It has therefore been assumed that data provided by third parties is accurate.

Key Parameters for Assessment and Assumptions

- 14.4.33 This section describes the key parameters and assumptions that have been used when undertaking the assessment presented within this ES Chapter. The assumptions are

based on information presented within ES Chapter 4: Project Description (**application document 6.2.4**) and include:

- Trenchless crossing construction methodology: The project has committed to undertaking trenchless crossings at the River Box, River Stour, Sudbury Branch Railway Line and to the south of Ansell's Grove. For the purposes of the assessment, it has been assumed that:
 - The proposed technique would be horizontal directional drilling (HDD), which requires launch and receiving pits on either side of a drilled section;
 - The assumption for the drilling direction of the trenchless crossings are provided in Table 4.7 of ES Chapter 4: Project Description (**application document 6.2.4**), but the assessment presented in this chapter considers both potential drilling directions as a worst-case; and
 - The duration of the drilling would be in the order of several months (as per ES Appendix 4.2: Construction Schedule (**application document 6.3.4.2**)) and would therefore likely exceed the temporal requirements for significance of at least 10 days/nights in any 15 consecutive days.
- Assumed working hours: The working hours are those described in ES Chapter 4: Project Description (**application document 6.2.4**), which are as follows:
 - 07:00–19:00 Mondays to Fridays; and
 - 08:00–17:00 on Saturdays, Sundays and Bank Holidays.
- Exceptions to core working hours: As described in ES Chapter 4: Project Description (**application document 6.2.4**), there is no intention for night working on the project as standard. However, there may be occasions where night working is required, as set out in the operations that may take place outside of the core working hours. It is assumed that this would typically only occur on rare occasions and would be likely to last for only a short duration, not exceeding the temporal criteria, at any one location. The assessment therefore primarily focuses on the core weekday working hours. The exception is at the proposed trenchless crossings, where night-time working may be required to complete activities that once started need to continue;
- Piling assumptions: Percussive piling may be required at some pylon locations, at the temporary bridge crossings and for the foundations of the CSE compounds and GSP substation, depending on ground conditions. The assessment set out in this chapter assumes that piling is required at all pylon locations and at the CSE compounds and GSP substation (as a reasonable worst case scenario);
- Construction machinery: ES Appendix 14.1: Construction Noise and Vibration Data (**application document 6.3.14.1**) presents the project assumptions with regards to machinery that would be used and the anticipated noise levels associated with these that have been used within the assessment. These are considered to be likely machinery types given experience of constructing similar projects; and
- Construction traffic data assumptions: These are provided in the Transport Assessment (**application document 5.7**).

Embedded and Good Practice Measures

14.4.34 This section outlines the relevant embedded and good practice measures that have been embedded into the design of the project and therefore the assessment has been undertaken on the assumption that these measures would be carried out. All assessment work has applied a precautionary principle, in that where limited information is available (in terms of the project design), a realistic worst-case scenario is assessed.

Relevant Embedded Measures

14.4.35 The REAC (**application document 7.5.2**) presents the embedded measures that have been identified through the environmental assessment as part of the iterative design and have been committed to as part of the application of the mitigation hierarchy, to avoid or reduce likely significant environmental effects to support a proportionate assessment. Embedded measures relevant to operational noise and vibration include:

- EM-P03: The project would include triple Araucaria conductors or alternative technology that performs to the same or better standard in relation to noise on standard lattice pylons; and
- EM-H01: The GSP substation would include a noise enclosure around the transformers and this is built into the designs.

14.4.36 As noted in Section 14.3, noise effects from operation of the project are scoped out based on these embedded measures. Further information is provided in ES Appendix 14.3: Overhead Line Noise Assessment (**application document 6.3.14.3**) and ES Appendix 14.4: GSP Substation Noise Assessment (**application document 6.3.14.4**).

Good Practice Measures

14.4.37 The CoCP (**application document 7.5.1**) sets out the standard good practice measures that would be undertaken during construction of the project if it is granted consent. The relevant good practice measures relating to noise and vibration include:

- NV01: Construction working would be undertaken within the agreed working hours set out within the Development Consent Order (DCO). BPM to reduce construction noise would be set out within the Construction Environmental Management Plan (CEMP).
- GG05: Construction workers would undergo training to increase their awareness of environmental issues, including working hours and noise and vibration reduction measures;
- GG10: Any activity carried out or equipment located within a construction compound that may produce a noticeable nuisance, including but not limited to dust, noise, vibration and lighting, would be located away from sensitive receptors such as residential properties or designated ecological sites where practicable;
- GG12: Plant and vehicles would conform to relevant applicable standards. Vehicles would be correctly maintained and operated in accordance with manufacturer's recommendations and in a responsible manner. All plant and vehicles would be required to switch off their engines when not in use and when it is safe to do so; and

- GG27: The Contractor would undertake regular inspections of the temporary access routes and bellmouths to check for potholes or other defects. These would be repaired in a timely manner.

14.4.38 NV01 commits the contractor to using BPM to reduce construction noise. However, for the purposes of the construction noise assessment presented in this chapter and in order to identify locations where significant noise effects could occur, it is assumed that no site-specific BPM measures are included within the assessment presented in Section 14.6. This therefore presents a reasonable worst-case in order to identify the locations where localised screening or other site-specific mitigation may be required.

14.4.39 Similarly, with regards to vibration, the assessment in Section 14.6 assumes a reasonable worst-case scenario with regards to piling and compaction plant and activities in order to highlight any potential vibration 'hot-spots' where additional consideration of vibration reduction measures may be required.

14.5 Baseline Environment

Existing Baseline

14.5.1 NSR near the project are predominantly isolated dwellings. There are, however, settlements within 1km of the Order Limits including Burstall, Hintlesham, Hadleigh, Layham, Polstead Heath, Polstead, Hagmore Green, Leavenheath, Assington, Lamarsh, Alphamstone, Henny Street, Great Henny, Twinstead, Twinstead Green and Wickham St Paul. Residential and non-residential NSR are shown on ES Figure 14.1: Noise Baseline (**application document 6.4**).

14.5.2 Existing ambient and background noise levels in the Order Limits are generally low (typically below 50 dB $L_{Aeq,16h}$ during daytime periods, and below 40 dB $L_{Aeq,8h}$ during night-time periods), typical of a rural environment, with higher noise levels expected close to existing roads, particularly the A1071, A134 and A131. This is corroborated by Defra (2017) strategic noise mapping data.

Construction Noise

14.5.3 Construction noise impacts are assessed against threshold values, following the guidance of Annex E.3.2 of BS 5228-1, which are set relative to the ambient noise level, subject to lower thresholds. Given the rural setting of the project, the ambient noise levels are expected to be low, and the lower thresholds would apply.

Construction Vibration

14.5.4 Construction vibration impacts are assessed against threshold values as defined by BS 5228-2. It is assumed that there are no notable extraneous sources of vibration affecting NSR and that existing vibration levels are negligible.

Construction Traffic Noise

14.5.5 Construction traffic noise impacts are assessed relative to the pre-existing road noise level calculated via baseline traffic data. These values are presented in ES Appendix 14.2: Construction Traffic Noise and Vibration Assessment (**application document 6.3.14.2**), for each affected route.

14.5.6 Additionally, there are several NIA on the existing public highway along routes. NIA are determined via strategic noise maps and highlight the residential areas experiencing the highest 1% of noise levels from road and rail sources in England. These are generally away from the Order Limits but may be applicable in relation to potential construction routes on the local road network that would be used by construction traffic. The NIA near the Order Limits and the proposed construction routes are shown on ES Figure 14.1: Noise Baseline (**application document 6.4**) and are as follows:

- NIA_4798 – A114 southwest of Ipswich;
- NIA_11345 – A1072 southeast of Burstall;
- NIA_11346 – A1071 in Hintlesham;
- NIA_11347 – A1071 northwest of Hintlesham;
- NIA_12012, NI_12013 and NI_12014 – A134 in Newton;
- NIA_12015 – A134 between Sudbury and Newton;
- NIA_12016 – A131 southwest of Twinstead Green; and
- NIA_12017 – A131 at Little Maplestead.

Future Baseline

14.5.7 The future baseline is not expected to materially change in the reasonably foreseeable future with regards to noise and vibration.

14.6 Likely Significant Effects During Construction (Without Mitigation)

Introduction

14.6.1 This section sets out the likely significant effects of the project on NSR during construction. The assessment assumes that there are no site-specific mitigation measures (such as screening or other specific BPM associated with a certain location). The results of the assessment then inform the need for any additional mitigation requirements during construction (see Section 14.8).

14.6.2 As described in ES Chapter 4: Project Description (**application document 6.2.4**), the main project comprises reinforcement of an existing transmission network with a combination of underground cables and overhead lines, and this in some chapters is assessed separately to the provision of a GSP substation. The noise and vibration assessment considers the project as a whole (main works and GSP substation together) to allow for a full consideration of the effects on receptors. In addition, the construction routes used would apply for the whole project. Therefore, the main project and GSP substation are both assessed together.

14.6.3 The assessment presented in Sections 14.6 to 14.10 is based on the Proposed Alignment, which is the design that is shown on ES Figure 4.1: The Project (**application document 6.4**). However, it should be noted that the permanent aspects of the project, including pylon locations, are not fixed and could be located anywhere within the LoD, as defined on the Work Plans (**application document 2.5**). The sensitivity testing in Section

14.11 considers whether there would be new or different effects should alternative locations be taken forward.

Construction Noise and Vibration Assessment

14.6.4 There are a number of sources of construction noise and vibration during construction. The nature and duration of the works varies with a combination of relatively short duration works and long duration works at fixed stationary locations, and intermittent linear works. Stationary works are those that would occur at a relatively fixed location for the duration of the specific activity, such as the proposed GSP substation or a construction compound. Linear works are those that would move along the route, such as cabling or overhead line construction and removal, with works at a specific location for a relatively short duration.

14.6.5 For the purposes of this assessment, it assumes that there is potential for works to exceed the temporal requirement for significance of ten days in any 15 consecutive days, or 40 days in any consecutive six months, as a reasonable worst case and to highlight potential noise and/or vibration 'hot-spots', although in practice some works may be of a shorter duration. Where a shorter duration is highly likely, and is therefore not expected to be significant, this has been stated.

14.6.6 Anticipated works are as follows:

- Setup of site compounds and bellmouth and temporary access route construction;
- Operation of site compounds;
- GSP substation construction;
- Construction of underground cables;
- HDD for trenchless crossings;
- Construction of pylons and overhead lines;
- Modification works to the existing overhead line; and
- Removal of overhead lines.

14.6.7 Construction noise and vibration data and calculations are provided in ES Appendix 14.1: Construction Noise and Vibration Data (**application document 6.3.14.1**) and ES Appendix 14.2: Construction Traffic Noise Assessment (**application document 6.3.14.2**). Results are also shown on ES Figure 14.2: Construction Noise Effects, and ES Figure 14.3: Construction Vibration Effects (**application document 6.4**).

Construction Noise

Daytime Construction Noise

14.6.8 Adverse impacts are deemed to occur where the construction noise level during the day is likely to exceed the lowest observed adverse effect level (LOAEL) of 50 dB $L_{Aeq,10h}$ at residential or medium sensitivity non-residential NSR. Significant adverse effects are deemed to occur during daytime periods where the construction noise level during the day is likely to exceed, for at least ten days in any 15 consecutive days or 40 days in any consecutive six months, either the:

- SOAEL of 65 dB $L_{Aeq,10h}$ at a residential or medium sensitivity non-residential NSR; or
- LOAEL of 50 $L_{Aeq,10h}$ at a high sensitivity non-residential NSR during core daytime periods.

14.6.9 Table 14.1 summarises the NSR which may experience significant adverse effects from construction activities during daytime periods. This indicates that there are potential significant adverse effects at seven NSR during the daytime works. This includes six residential NSR and one non-residential NSR. NSR which may potentially experience short term **significant adverse effects** from construction activities are also shown on ES Figure 14.2: Construction Noise Effects (**application document 6.4**).

14.6.10 Adverse impacts, where the daytime construction noise LOAEL of 50 dB $L_{Aeq,10h}$ would be exceeded, would be expected to occur at approximately 270 NSR but the effects would not be significant. The daytime construction noise LOAEL of 50 dB $L_{Aeq,10h}$ would not be exceeded (and therefore would be **not significant**) at all other residential and non-residential NSR.

Night-Time Construction Noise

14.6.11 There is potential night-time working associated with the four trenchless crossings (River Box, River Stour, Sudbury Branch Railway Line and to the south of Ansell's Grove), where once started certain activities need to continue until completed. As works are anticipated to exceed ten nights, the night-time construction noise SOAEL is likely to be exceeded within approximately 350m of the works, unless screened by existing intervening structures or buildings.

14.6.12 Table 14.1 summarises the NSR which may experience significant adverse effects from construction activities during night-time periods. This indicates that there are potential short term **significant adverse effects** at 12 NSR during night-time works.

Table 14.1 – Construction Noise Assessment Summary of Potential Significant Effects (Without Mitigation)

Construction Phase	Property Address, Grid Reference, and Predicted Noise Level	Magnitude of Impact	Receptor Sensitivity	Significance	Applicable Works Location
Daytime Noise Assessment					
Construction of underground cables	Daws Hall Education Centre, Henny Road, Lamarsh, CO8 5EX (588737, 236699) (Non-residential). 53 dB L _{Aeq,10h}	Small	High (Education)	Significant	Underground cables approximately 160m to the south of receptor.
Construction of pylons and overhead lines	Hill House Farm, Burstall Hill, IP8 3EB (609110, 245633) (Residential). 71 dB L _{Aeq,10h}	Large	Residential	Significant	Pylon 4Y004A (Realignment/construction)
	Chestnut Grove Cottage, Bures Road, Assington, CO10 5NF (592591,236932) (Residential). 67 dB L _{Aeq,10h}	Medium	Residential	Significant	Pylon RB44 (Construction)
	Kennels Cottage, George Street, Hintlesham, IP8 3NS (608100,244303) (Residential). 67 dB L _{Aeq,10h}	Medium	Residential	Significant	Pylon RB7 (Construction)
	Caravan at Popes Green Farm House, Popes Green Lane, Layham, IP7 5FF (600624,239761) (Residential) 66 dB L _{Aeq,10h}	Medium	Residential	Significant	Pylon RB33 (Construction)
	Pipkin House, Pipkin Hill, Layham, IP7 5JS (603405,240855) (Residential). 66 dB L _{Aeq,10h}	Medium	Residential	Significant	Pylon RB25 (Construction)
Removal of overhead lines	Mobile Farm at New Hill Farm, Lorkin's Lane, Twinstead, CO10 7PD (587034,236398) (Residential). 68 dB L _{Aeq,10h}	Medium	Residential	Significant	Pylon 4YLA002 (Removal)

Construction Phase	Property Address, Grid Reference, and Predicted Noise Level	Magnitude of Impact	Receptor Sensitivity	Significance	Applicable Works Location
Night-Time Noise Assessment					
Trenchless crossing of the River Stour	Walnut House, Sudbury Road, Bures St Mary, CO8 5JT (589865,236659) (58 dB L _{Aeq,1h})	Large	Residential	Significant	Trenchless crossing
	1 Highview, Sudbury Road, Bures St Mary, CO8 5JT (589942,236560) (49 dB L _{Aeq,1h})	Medium	Residential	Significant	Trenchless crossing
	2 Highview, Sudbury Road, Bures St Mary, CO8 5JT (589936,236569) (49 dB L _{Aeq,1h})	Medium	Residential	Significant	Trenchless crossing
	Grassmere Farm, Bures Road, Little Cornard, CO10 0NU (589658,236994) (46 dB L _{Aeq,1h})	Medium	Residential	Significant	Trenchless crossing
Trenchless crossing of Sudbury Branch Railway Line	Daws Hall Cottage, Henny Road, Lamarsh, CO8 5EX (588753,236616) (55 dB L _{Aeq,1h})	Large	Residential	Significant	Trenchless crossing
	Pitmire Cottage, Henny Road, Lamarsh, CO8 5EX (588877,236771) (46 dB L _{Aeq,1h})	Medium	Residential	Significant	Trenchless crossing
Trenchless crossing to the south of Ansell's Grove	Ansell's Farm, Henny Back Road, Alphamstone, CO8 5HN (587293,235805) (53 dB L _{Aeq,1h})	Large	Residential	Significant	Trenchless crossing
	Little Ansell's, Henny Back Road, Alphamstone, CO8 5HN (587309,235830) (52 dB L _{Aeq,1h})	Large	Residential	Significant	Trenchless crossing
	Lightlands, Twinstead Road, Lamarsh, CO8 5HA, (587806,236332) (49 dB L _{Aeq,1h})	Medium	Residential	Significant	Trenchless crossing
	Hill House Farm, Moat Lane, Alphamstone Back Road, Lamarsh, CO8 5HB (588047,236169) (48 dB L _{Aeq,1h})	Medium	Residential	Significant	Trenchless crossing

Construction Phase	Property Address, Grid Reference, and Predicted Noise Level	Magnitude of Impact	Receptor Sensitivity	Significance	Applicable Works Location
	Annex at Hill Farm, Moat Lane, Alphamstone Back Road, Lamarsh, CO8 5HB (588044,236172) (48 dB L _{Aeq,1h})	Medium	Residential	Significant	Trenchless crossing
	Moorcot, Henny Back Road, Alphamstone, CO8 5HN (587191,235694) (47 dB L _{Aeq,1h})	Medium	Residential	Significant	Trenchless crossing

Construction Vibration

- 14.6.13 The majority of construction activities are not expected to generate significant levels of vibration. However, activities that may generate significant levels of vibration include:
- Ground compaction – this may be required during activities such as the construction of temporary access routes; and
 - Percussive or vibratory piling – this may be required for activities such as the foundation works of new pylons.

Construction Vibration Effects on People Within Buildings

- 14.6.14 Adverse impacts are deemed to occur where the construction vibration level is likely to exceed the LOAEL of 0.3 mm/s at residential or medium sensitivity non-residential NSR. Significant adverse effects are deemed to occur where the construction vibration level during the day is likely to exceed, for at least ten days in any 15 consecutive days or 40 days in any consecutive six months, the:
- SOAEL of 1.0 mm/s PPV at a residential or medium sensitivity non-residential NSR; or
 - LOAEL of 0.3 mm/s PPV at a high sensitivity non-residential NSR.
- 14.6.15 Details of the number of NSR likely to experience significant adverse effects from construction vibration are provided in Table 14.2.
- 14.6.16 The construction vibration assessment indicates that there are potential short term **significant adverse effects** at one NSR. There are three further NSR where the SOAEL is likely to be exceeded during compaction activities of temporary access routes, although this activity would be expected to be relatively short (typically during a single day) and is therefore not for a duration that would be considered significant (Table 14.2).
- 14.6.17 There are **no significant** effects expected at non-residential NSR due to construction vibration.
- 14.6.18 Adverse impacts, where the construction vibration LOAEL of 0.3 mm/s PPV would be exceeded and vibration might be perceptible, would be expected to occur at approximately 30 residential NSR but the effects would be **not significant**.

Construction Vibration Effects on Structures (Potential Cosmetic Damage)

- 14.6.19 Consideration has been given to locations where vibration levels may be high enough to cause cosmetic damage to buildings. This would occur at vibration levels much higher than the level at which vibration would be just perceptible and would only be expected to effect buildings or structures very close to sources of vibration (e.g. within 10m of piling or 2m of compaction works). Cosmetic damage is not likely to occur at vibration levels below 12.5 mm/s PPV but may occur above this level. It should be noted that levels of vibration two to four times higher would be required to cause potential structural damage.
- 14.6.20 There are no identified locations where the predicted vibration level is likely to cause cosmetic damage to buildings.

Table 14.2 – Construction Vibration Assessment Summary

Construction Activity	Site Location(s)	Likely to exceed SOAEL (1mm/s PPV) at NSR? (Property Address and Grid Reference)	Exceedance for Significant Duration Likely?	Significant Effect?	Number of Significantly Affected NSR
Compaction					
Compound set up	NA	No	No	No	0
Access tracks	Access track off Rectory Lane to pylon 4YL084 (modification).	Oakleigh, Rectory Lane, Wickham St. Paul, PO9 2PJ (583039, 236898). 2.0 mm/s PPV	No	No	0
	Access track off Rectory Lane to pylon 4YL084 (modification).	Wychfield, Rectory Lane, Wickham St. Paul (583033, 236903). 2.0 mm/s PPV	No	No	0
	Access track off Bures Road to pylons RB44 (new) and PCB 70 (removal).	Cheston Grove, Burnes Road, Assington, (592591, 236932) 1.8 mm/s PPV	No	No	0
	All others	No	No	No	0
Substation construction	NA	No	Yes	No	0
Piling					
Substation construction	NA	No	Yes	No	0
Pylon construction	Pylon 4Y004A (Realignment)	Hill House Farm, Burstall Hill, (609110, 245633) 1.7 mm/s PPV	Yes, potentially	Yes	1

Construction Traffic Noise

- 14.6.21 During construction, there would be additional vehicle traffic (including heavy goods vehicles) on the local road network, travelling to and from the work sites. An assessment of potential noise impacts from construction traffic is presented in ES Appendix 14.2: Construction Traffic Noise Assessment (**application document 6.3.14.2**).
- 14.6.22 The assessment indicates that construction traffic noise impacts are negligible on all routes, with the exception of one route (namely the route between the A131 and Henny Road via Twinstead Green, Church Road and Twinstead Road), where a minor magnitude impact expected. The impact of noise from construction traffic is therefore **not significant** at all NSR.

Summary of Construction Effects

- 14.6.23 The construction phase of the project would generate noise and vibration through the operation of construction machinery and increased traffic on the local road network. However, noise and vibration effects would be expected to be not significant from the majority of the proposed construction activities. There are potential significant adverse effects at:
- Seven NSR due to daytime construction noise;
 - Twelve NSR due to potential night-time construction noise in relation to the trenchless crossings; and
 - One NSR due to construction vibration.

14.7 Likely Significant Effects During Operation (Without Mitigation)

- 14.7.1 Operational effects in relation to noise and vibration have been scoped out of the assessment see Section 14.3 for details.

14.8 Proposed Mitigation During Construction

Introduction

- 14.8.1 This section sets out the proposed additional mitigation for the likely significant effects during construction outlined in Section 14.6. The additional mitigation measures are listed in the REAC, which forms Appendix B to the CEMP (**application document 7.5.2**). The CEMP is secured through Requirement 4 of the draft DCO (**application document 3.1**).

Construction Noise

- 14.8.2 As set out in paragraph 14.4.34, the construction noise assessment presented in Section 14.6 assumes that there are no site-specific BPM (such as screening) included, so as to present a reasonable worst case and identify construction noise 'hot-spots' where site-specific mitigation measures may be required.
- 14.8.3 The assessment presented in Section 14.6 has identified potential significant adverse effects at seven NSR due to daytime construction noise, and 12 NSR due to night-time

works. The highest exceedance of the relevant thresholds at these properties is 6 dB (daytime) and 10 dB (night-time).

14.8.4 National Grid has committed to undertake additional mitigation (EIA_NV01) to reduce the significant effects to a non-significant level. Additional temporary noise mitigation measures would be put in place to reduce noise levels from construction plant and machinery at the following locations, unless a detailed assessment is undertaken which demonstrates that no significant noise impacts would occur to nearby NSR:

- Underground cables approximately 160m to the south of Dews Hall Education Centre, Henny Road, Lamarsh, CO8 5EX (588737, 236699);
- Pylon 4Y004A (Realignment/construction) (609163,245621);
- Pylon RB44 (Construction) (592553,237006);
- Pylon RB7 (Construction) (608185,244251);
- Pylon RB33 (Construction) (600664,239851);
- Pylon RB25 (Construction) (603394,240956);
- Pylon 4YLA002 (Removal) (587008,236421);
- Trenchless crossing of the River Stour (night-time works) (589271,236627 and 589846,236774);
- Trenchless crossing of the Sudbury Branch Railway Line (night-time works) (588758,236508 and 589213,236612); and
- Trenchless crossing to the south of Ansell’s Grove (night-time works) (587186,235954 and 587832,236098).

14.8.5 Examples of construction noise mitigation measures are provided in Table 14.3 with the attenuation values that these typically achieve.

Table 14.3 – Examples of Construction Noise Mitigation Measures

Example Mitigation	Likely Attenuation
Screening	5 dB where activities are partially obscured and 10 dB where activities are totally obscured
Specified use of quieter plant	5 to 10 dB
Suitable material handling methods. Do not drop materials from excessive heights	Up to 15 dB
Alternative methods for pylon construction e.g. use of pad foundation	10 to 20 dB
Use an acoustic shed with adequate ventilation around trenchless crossing machinery	Up to 15 dB

14.8.6 In addition, Chapter 14: Noise and Vibration of the CEMP (**application document 7.5**), in the section on site planning and preparation, states that the contractor would conduct detailed construction noise assessments of the activities identified to determine whether

there are likely to be any new or different significant adverse effects at NSR and therefore whether additional measures, including site-specific BPM, may be required.

Construction Vibration

- 14.8.7 As set out in paragraph 14.4.39, the construction vibration assessment presented in Section 14.6 assumes that there are no site-specific BPM (such as screening) included, in order to identify a reasonable worst case and identify construction vibration ‘hot-spots’ where specific mitigation measures may be required.
- 14.8.8 The assessment presented in Section 14.6 has identified a potential significant adverse effect from construction vibration at one NSR due to piling activities:
- Pylon 4Y004A (Realignment/construction) approximately 45m to the east of Hill House Farm, Burstall Hill, IP8 3EB (609110, 245633).
- 14.8.9 National Grid has identified the following additional mitigation measure (EIA_NV02) to mitigate construction vibration at this location. Additional temporary measures would be put in place to reduce vibration levels from construction plant and machinery at pylon 4Y004A, to the east of Hill House Farm, Burstall Hill (609110, 245633), unless a detailed assessment is undertaken which demonstrates that no significant vibration impacts would occur. Examples of construction vibration mitigation measures are provided in Table 14.4.

Table 14.4 – Example Construction Vibration Mitigation Measures

Example Mitigation	Likely Attenuation
Alternative methods for pylon construction, for example use of pad foundation or press-in piles	Would not generate material levels of vibration, therefore removing impact
Reducing energy per blow	Depends on the energy reduction but could be set relative to the impact thresholds. However, this may increase the duration of activities
Pre-boring for piled foundations	Dependant on ground conditions

- 14.8.10 In addition, Chapter 14: Noise and Vibration of the CEMP (**application document 7.5**), in the section on site planning and preparation, states that the contractor would conduct construction vibration assessments to determine whether there are likely to be any new or different significant adverse effects at NSR and therefore whether additional measures, including site-specific BPM, may be required.

14.9 Proposed Mitigation During Operation

- 14.9.1 Operational effects in relation to noise and vibration have been scoped out of the assessment see Section 14.3 for details. Therefore, no mitigation is required.

14.10 Residual Significant Effects (With Mitigation)

Construction Noise

- 14.10.1 The assessment has identified potential significant adverse effects at seven construction works sites affecting seven NSR due to daytime construction noise, and three construction works sites affecting 12 NSR due to potential night-time construction noise.

The highest exceedance of the relevant thresholds at these properties is 6 dB during daytime periods, and 13 dB during night-time periods. These numbers are within the range that would be mitigated through site-specific BPM as shown in Table 14.5. The examples provided in Table 14.3 and in BS 5228-1 (and other applicable guidance), are all standard tried and tested BPM measures that are used on many other construction projects and have been proven to be effective in reducing noise effects.

- 14.10.2 On the basis that the additional mitigation (EIA_NV01) would be secured through the CEMP (**application document 7.5**), it is concluded that the construction noise levels can be reduced such that that significant adverse effects would be avoided at all NSR.

Table 14.5 – Construction Noise Assessment Summary of Potential Significant Effects (With Mitigation)

Construction Phase	Property Address, Grid Reference, and Predicted Noise Level	Predicted Noise Level Without Mitigation	Likely Attenuation (See Table 14.3)	Predicted Noise Level With Mitigation	Magnitude of Impact	Receptor Sensitivity	Significance
Daytime Assessment							
Construction of underground cables	Daws Hall Education Centre, Henny Road, Lamarsh, CO8 5EX (588737, 236699)	53 dB L _{Aeq,10h}	≥5 dB	≤48 dB L _{Aeq,10}	Negligible	High (Educational)	Not Significant
Construction of pylons and overhead lines	Hill House Farm, Burstall Hill, IP8 3EB (609110, 245633)	71 dB L _{Aeq,10h}	≥10 dB	≤61 dB L _{Aeq,10h}	Small	Residential	Not Significant
	Chestnut Grove Cottage, Bures Road, Assington, CO10 5NF (592591, 236932)	67 dB L _{Aeq,10h}	≥5 dB	≤62 dB L _{Aeq,10h}	Small	Residential	Not Significant
	Kennels Cottage, George Street, Hintlesham, IP8 3NS (608100, 244303)	67 dB L _{Aeq,10h}	≥5 dB	≤62 dB L _{Aeq,10h}	Small	Residential	Not Significant
	Caravan at Popes Green Farm House, Popes Green Lane, Layham, IP7 5FF (600624, 239761)	66 dB L _{Aeq,10h}	≥5 dB	≤61 dB L _{Aeq,10h}	Small	Residential	Not Significant
	Pipkin House, Pipkin Hill, Layham, IP7 5JS (603405, 240855)	66 dB L _{Aeq,10h}	≥5 dB	≤61 dB L _{Aeq,10h}	Small	Residential	Not Significant
Removal of overhead lines	Mobile Farm at New Hill Farm, Lorkin's Lane, Twinstead, CO10 7PD (587034, 236398)	68 dB L _{Aeq,10h}	≥5 dB	≤63 dB L _{Aeq,10h}	Small	Residential	Not Significant

Construction Phase	Property Address, Grid Reference, and Predicted Noise Level	Predicted Noise Level Without Mitigation	Likely Attenuation (See Table 14.3)	Predicted Noise Level With Mitigation	Magnitude of Impact	Receptor Sensitivity	Significance
Night Time Assessment							
Trenchless crossing of the River Stour	Walnut House, Sudbury Road, Bures St Mary, CO8 5JT (589865, 236659)	58 dB L _{Aeq,1h}	≥15 dB	≤43 dB L _{Aeq,1h}	Small	Residential	Not Significant
	1 Highview, Sudbury Road, Bures St Mary, CO8 5JT (589936, 236569)	49 dB L _{Aeq,1h}	≥5 dB	≤44 dB L _{Aeq,1h}	Small	Residential	Not Significant
	2 Highview, Sudbury Road, Bures St Mary, CO8 5JT (589936, 236569)	49 dB L _{Aeq,1h}	≥5 dB	≤44 dB L _{Aeq,1h}	Small	Residential	Not Significant
	Grassmere Farm, Bures Road, Little Cornard, CO10 0NU (589658, 236994)	46 dB L _{Aeq,1h}	≥5 dB	≤41 dB L _{Aeq,1h}	Small	Residential	Not Significant
Trenchless crossing of Sudbury Branch Railway Line	Daws Hall Cottage, Henny Road, Lamarsh, CO8 5EX (588753, 236616)	55 dB L _{Aeq,1h}	≥10 dB	≤45 dB L _{Aeq,1h}	Small	Residential	Not Significant
	Pitmire Cottage, Henny Road, Lamarsh, CO8 5EX (588877, 236771)	46 dB L _{Aeq,1h}	≥5 dB	≤41 dB L _{Aeq,1h}	Small	Residential	Not Significant
Trenchless crossing to the south of Ansell's Grove	Ansell's Farm, Henny Back Road, Alphamstone, CO8 5HN (587293, 235805)	53 dB L _{Aeq,1h}	≥10 dB	≤43 dB L _{Aeq,1h}	Small	Residential	Not Significant
	Little Ansell's, Henny Back Road, Alphamstone, CO8 5HN (587309, 235830)	52 dB L _{Aeq,1h}	≥10 dB	≤42 dB L _{Aeq,1h}	Small	Residential	Not Significant

Construction Phase	Property Address, Grid Reference, and Predicted Noise Level	Predicted Noise Level Without Mitigation	Likely Attenuation (See Table 14.3)	Predicted Noise Level With Mitigation	Magnitude of Impact	Receptor Sensitivity	Significance
	Lightlands, Twinstead Road, Lamarsh, CO8 5HA (587806, 236332)	49 dB $L_{Aeq,1h}$	≥5 dB	≤44 dB $L_{Aeq,1h}$	Small	Residential	Not Significant
	Hill House Farm, Moat Lane, Alphamstone Back Road, Lamarsh, CO8 5HB (588047, 236169)	48 dB $L_{Aeq,1h}$	≥5 dB	≤43 dB $L_{Aeq,1h}$	Small	Residential	Not Significant
	Annex at Hill Farm, Moat Lane, Alphamstone Back Road, Lamarsh, CO8 5HB (588044, 236172)	48 dB $L_{Aeq,1h}$	≥5 dB	≤43 dB $L_{Aeq,1h}$	Small	Residential	Not Significant
	Moorcot, Henny Back Road, Alphamstone, CO8 5HN (587191, 235694)	47 dB $L_{Aeq,1h}$	≥5 dB	≤42 dB $L_{Aeq,1h}$	Small	Residential	Not Significant

Construction Vibration

- 14.10.3 There are potential significant adverse effects from construction activities at one NSR (Hill House Farm at Burstall Hill), which has a predicted vibration level of 1.7mm/s PPV without mitigation. The vibration level is within the range that would be mitigated through the implementation of site-specific BPM, such as the examples provided in Table 14.4 and in BS 5228-2 (and other applicable guidance). These are all standard tried and tested BPM measures that are used on many other construction projects and have been proven to be effective in reducing noise effects.
- 14.10.4 On the basis that the additional mitigation (EIA_NV02) would be secured through the CEMP (**application document 7.5**), it is concluded that construction vibration levels can be reduced such that that significant adverse effects would be avoided at all NSR.

Summary

- 14.10.5 Table 14.6 summarises the likely significant effects, proposed mitigation and residual effects from noise and vibration during construction. The references to duration are based on the criteria in Section 5.3 of ES Chapter 5: EIA Approach and Method (**application document 6.2.5**).

Table 14.6 – Summary of Likely Significant Effects

Aspect/Proposed Matter	Likely Significant Effect (Without Additional Mitigation)	Proposed Additional Mitigation	Residual Significant Effect (With Additional Mitigation)
Construction			
Significant noise effects at 19 NSR (seven daytime and 12 night time)	Short term moderate adverse	EIA_NV01: Additional temporary noise mitigation measures (site-specific BPM) would be put in place to reduce noise levels from construction plant and machinery at the 19 NSR listed in Section 14.6, unless a detailed assessment is undertaken which demonstrates that no significant noise impacts would occur.	Short term neutral to minor adverse
Significant vibration effects at one NSR	Short term moderate adverse	EIA_NV02: Additional temporary measures (site-specific BPM) would be put in place to reduce vibration levels from construction plant and machinery at pylon 4Y004A, to the east of Hill House Farm, Burstall Hill (609110, 245633), unless a detailed assessment is undertaken which demonstrates that no significant vibration impacts would occur.	Short term neutral to minor adverse

14.11 Sensitivity Testing

Introduction

- 14.11.1 This section outlines alternative approaches to the baseline assessment presented in Sections 14.6 to 14.10. It considers the alternative construction schedule, which is described in ES Appendix 4.2: Construction Schedule (**application document 6.3.4.2**) and also flexibility between the baseline design and method set out within ES Chapter 4: Project Description (**application document 6.2.4**) and the Proposed Alignment shown on ES Figure 4.1: The Project (**application document 6.4**). Further details on the flexibility assumptions are outlined in Section 4.2 of ES Chapter 4: Project Description (**application document 6.2.4**).

Assessment of Alternative Construction Schedule

- 14.11.2 This chapter assumes the baseline construction schedule described in ES Appendix 4.2: Construction Schedule (**application document 6.3.4.2**) for the purposes of the assessment. Sensitivity testing considering the alternative scenario, which has a later start date due to the GSP substation being delivered pursuant to the Development Consent Order, has shown that there would be no new or different likely significant effects to those identified in the baseline construction schedule assessed in Sections 14.6 to 14.10 of this chapter.

Flexibility in Design

Flexibility In Trenchless Crossings

- 14.11.3 The assessment of construction noise from trenchless crossing has considered reasonable worst-case assumptions in terms of drill direction and both drill directions have been assessed. As such, varying the construction method is not likely to result in new or different significant effects to those identified in Sections 14.6 to 14.10 of this chapter.
- 14.11.4 The assessment assumes night-time works at the trenchless crossings. If these works are conducted during daytime periods significant adverse effects would be avoided.

Flexibility In Construction Method

- 14.11.5 The construction noise assessment has considered reasonable worst-case assumptions in terms of methodology using typical machinery and plant. As such, varying the construction method is not likely to result in new or different significant effects in most instances. However, should an alternative construction method be required which may generate more noise or vibration, the contractor would employ site-specific BPM to reduce level noise and vibration impacts as described in Chapter 14 of the CEMP (**application document 7.5**).
- 14.11.6 The assessment assumes piling at all pylon locations, the CSE compounds and the GSP substation. If the ground investigations identified that piling was not required at all locations, then significant adverse effects could be avoided.

Flexibility Within The Order Limits

- 14.11.7 The assessment presented within Sections 14.6 to 14.10 has assumed the Proposed Alignment, including pylon locations shown on ES Figure 4.1: Proposed Project

(**application document 6.4**). It should be noted that as described in ES Chapter 4: Project Description (**application document 6.2.4**), the Proposed Alignment is not fixed and could be subject to change within the defined Limits of Deviation (LoD) within the parameters shown on the Works Plans (**application document 2.5**).

14.11.8 Sensitivity testing has been carried out to determine the potential for likely significant effects should alternative pylon locations (and piled foundations) be taken forward within the LoD. Changes to pylon position within the LoD would have implications for the level of construction noise and vibration during construction experienced by NSR. For example, moving a pylon location closer to a NSR would lead to an increase in noise and vibration. Relocating a pylon within the lateral or/and longitudinal LoD within the parameters shown on the Works Plans (**application document 2.5**) may lead to potential short term **significant adverse effects** at four additional NSR, as follows:

- Hillview, Nayland Road, Assington, CO10 5LR (594111,237239);
- Valley Farm, Rands Road, Layham, IP7 5RW (601613,240314);
- Kates Hill Farm, Pond Hall Road, Hadleigh, IP7 5PP (605060,241384);
- The Cottage, Clay Lane, Hadleigh, IP7 5PX (605767,241500).

14.11.9 Although there is the potential for significant adverse effects at these four additional NSR, the same mitigation measures outlined in Section 14.8 would apply, namely that further detailed assessments of potential impacts would be conducted by the contractor prior to construction and the need for site-specific BPM, including localised screening, would be determined. This is described in Chapter 14 of the CEMP (**application document 7.5**). The relevant planning authority would be consulted to determine whether an application for prior consent under Section 61 of the Control of Pollution Act 1974 is required to provide compliance with BPM control measures. It is considered that when this mitigation is applied that there would be no residual significant effects.

14.12 Conclusion

14.12.1 The assessment has concluded that using a reasonable worst case and assuming no site-specific BPM, there are potential significant adverse effects at:

- Seven NSR due to daytime construction noise;
- Twelve NSR due to potential night-time construction noise in relation to the trenchless crossings;
- One NSR due to construction vibration; and
- Four additional NSR when considering flexibility offered within the LoD within the parameters shown on the Works Plans.

14.12.2 With the implementation of the additional mitigation measures, which would include site-specific BPM mitigation, it is anticipated that noise and vibration levels would be reduced such that significant adverse effects are avoided at all NSR. As such, the requirements of the NPS EN-1 are expected to be met.

National Grid plc
National Grid House,
Warwick Technology Park,
Gallows Hill, Warwick.
CV34 6DA United Kingdom

Registered in England and Wales
No. 4031152
nationalgrid.com